Designation: A 787 – 05

Standard Specification for Electric-Resistance-Welded Metallic-Coated Carbon Steel Mechanical Tubing[1]

This standard is issued under the fixed designation A 787; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

1. Scope*

1.1 This specification covers round, square, rectangular, and special shape, electric-resistance-welded mechanical tubing, either zinc-coated (galvanized) after welding or produced from aluminum-coated, zinc-coated (galvanized), zinc-iron alloy-coated (galvannealed), or 55 % aluminum-zinc alloy-coated steel sheet. Tubing for use as electrical conduit (EMT) or intermediate metallic conduit (IMC) is not covered by this specification.

1.2 This specification covers mechanical tubing with outside diameters or maximum outside dimensions ranging from ½ to 8 in. (12.7 to 203.2 mm) and wall thickness from 0.028 to 0.134 in. (0.71 to 3.40 mm).

1.3 Sizes outside the ranges listed above may be ordered provided all other requirements of the specification are met.

1.4 The values stated in inch-pound units are to be regarded as the standard. The values given in parentheses are for information only.

2. Referenced Documents

2.1 *ASTM Standards:* [2]

A 463/A 463M Specification for Steel Sheet, Aluminum-Coated by the Hot-Dip Process

A 653/A 653M Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process

A 792/A 792M Specification for Steel Sheet, 55 % Aluminum-Zinc Alloy-Coated by the Hot-Dip Process

A 924/A 924M Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process

B 6 Specification for Zinc

3. Classification

3.1 The types of tubing covered by this specification are:

Type Number	Code Letters	Description
1	AWAC	electric-resistance-welded aluminum-coated carbon steel mechanical tubing
2	AWG	electric-resistance-welded galvanized carbon steel mechanical tubing
3	AWPG	electric-resistance-welded carbon steel mechanical tubing, post-hot dipped galvanized
4	AWGA	electric-resistance-welded carbon steel mechanical tubing, zinc-iron alloy-coated (galvannealed)
5	AWGZ	electric-resistance-welded carbon steel mechanical tubing, 55 % aluminum-zinc alloy-coated

4. Ordering Information

4.1 The ordered wall thickness of the tubing shall be the total of the base metal and the metallic coating.

4.2 Orders for material under this specification shall include the following:

4.2.1 Quantity (feet, metres, or number of lengths),

4.2.2 Type, code letters, and description (Sections 1 and 3),

4.2.3 Applicable ASTM designation number(s),

4.2.4 Coating designation and type of coating,

4.2.5 Chemically treated or not chemically treated raw material,

4.2.6 Oiled or dry (Section 16),

4.2.7 Extra smooth coating (if required),

4.2.8 Customer application, including fabrication,

4.2.9 Flash condition (7.1),

4.2.10 Steel grade designation (Sections 5 and 9),

4.2.11 Report of chemical analysis if required (Sections 10 and 11),

4.2.12 Shape (round, square, rectangular, or special),

4.2.12.1 Dimensions: round—any two of the following: inside diameter, outside diameter, or wall thickness; square or rectangular—outside dimension, wall thickness, and corner radii, if required. (See 12.1 and 13.1 and 13.2.)

[1] This specification is under the jurisdiction of ASTM Committee A01 on Steel, Stainless Steel, and Related Alloys and is the direct responsibility of Subcommittee A01.09 on Carbon Steel Tubular Products.

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[2] For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

***A Summary of Changes section appears at the end of this standard.**

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4.2.13 Length: round tubing—mill lengths or definite cut lengths (see 12.2); square and rectangular tubing—mill cut lengths and specified length (see 13.4).

4.2.14 Squareness of cut: round tubing, if required (see 12.3); square and rectangular tubing, if required (see 13.7),

4.2.15 Burrs removed, if required (see 15.2),

4.2.16 Special packaging (Section 19),

4.2.17 Customer specification number, if applicable,

4.2.18 Special requirements,

4.2.19 Special marking (Section 18), and

4.2.20 Recoating of outside diameter weld and heat-affected area, on precoated steel, if required.

5. Process

5.1 The steel shall be made from any process.

5.1.1 If a specific type of melting is required by the purchaser, it shall be stated on the purchase order.

5.1.2 The primary melting may incorporate separate degassing or refining and may be followed by secondary melting, using electroslag remelting or vacuum remelting. If secondary melting is employed, the heat shall be defined as all of the ingots remelted from a single primary heat.

5.1.3 Steel may be cast in ingots or may be strand cast. When steel of different grades is sequentially strand cast, identification of the resultant transition material is required. The producer shall remove the transition material by an established procedure that positively separates the grades.

5.2 For tubing produced from precoated steel sheet, the composition of the coating shall comply with the applicable specification.

5.2.1 *Specification A 463/A 463M*—Coating designation for aluminum coated-sheet.

5.2.2 *Specification A 653/A 653M*—Coating designation for galvanized and galvannealed steel sheet.

5.2.3 *Specification A 792/A 792M*—Coating designation for 55 % aluminum-zinc alloy-coated steel sheet.

5.2.4 Other grades of coated steel sheet, as listed in Table 1 and Table 2, may be used as the precoated material for the steel tubing upon agreement between the manufacturer and the purchaser. Such steel sheet shall meet the requirements of Specification A 463/A 463M, A 653/A 653M, A 792/A 792M, and A 924/A 924M, except for the chemical requirements.

TABLE 1 Chemical Requirements for Low-Carbon Steels[A,B]

Grade Designation[C]	Composition, %			
	Carbon	Manganese	Phosphorus, max	Sulfur, max
MT1010	0.05 to 0.15	0.30 to 0.60	0.035	0.035
MT1015	0.10 to 0.20	0.30 to 0.60	0.035	0.035
MTX1015	0.10 to 0.20	0.60 to 0.90	0.035	0.035
MT1020	0.15 to 0.25	0.30 to 0.60	0.035	0.035
MTX1020	0.15 to 0.25	0.70 to 1.00	0.035	0.035

[A] Rimmed or capped steels that may be used for the above grades are characterized by a lack of uniformity in their chemical composition, and for this reason product analysis is not technologically appropriate unless misapplication is clearly indicated.

[B] Chemistry represents heat analysis. Product analysis, except for rimmed or capped steel, is to be in accordance with usual practice as shown in Table 5.

[C] The letters MT indicate mechanical tubing.

TABLE 2 Chemical Requirements for Other Carbon Steels[A]

Grade Designation	Composition, %			
	Carbon	Manganese	Phosphorus, max	Sulfur, max
1008	0.10 max	0.50	0.035	0.035
1010	0.08 to 0.13	0.30 to 0.60	0.035	0.035
1015	0.12 to 0.18	0.30 to 0.60	0.035	0.035
1016	0.12 to 0.19	0.60 to 0.90	0.035	0.035
1017	0.14 to 0.21	0.30 to 0.60	0.035	0.035
1018	0.14 to 0.21	0.60 to 0.90	0.035	0.035
1019	0.14 to 0.21	0.70 to 1.00	0.035	0.035
1021	0.17 to 0.24	0.60 to 0.90	0.035	0.035

[A] Chemistry represents heat analysis. Product analysis, except for rimmed or capped steel, is to be in accordance with usual practice as shown in Table 5.

6. Manufacture

6.1 Tubes shall be made by the electric-resistance welding process and shall be made from hot or cold-rolled precoated steel.

6.2 Special manufacturing practices allow for post-hot dipped galvanizing of welded tubing. If this product is desired all sections of this specification will apply except Table 3. Wall thickness tolerances shall be determined by agreement between the producer and purchaser.

7. Flash Conditions

7.1 The flash conditions under which tubing may be furnished are as follows: The flash shall be removed from the outside diameter of tubing covered by this specification. Tubing furnished to this specification may have the following conditions of welding flash on the inside diameter.

7.1.1 *Flash-In*— All tubing in which the inside diameter welding flash does not exceed the wall thickness or 3⁄32 in. (2.4 mm), whichever is less.

7.1.2 *Flash Controlled to 0.010 in. (0.254 mm), Maximum*— Tubing in which the height of the remaining welding flash is controlled so as not to exceed 0.010 in. This condition is available in over 0.750 in. (19.05 mm) outside diameter and gages consistent with Table 4.

7.1.3 *Flash Controlled to 0.005 in. (0.127 mm), Maximum*—When the inside diameter flash is controlled to 0.005 in. (0.127 mm) maximum in tubing produced to outside diameter and wall thickness, inside diameter and wall thickness, or outside diameter and inside diameter tolerances, the remaining inside diameter flash, if any, is part of the applicable inside diameter tolerance. This controlled flash is available in 0.750 in. (19.05 mm) outside diameter or greater.

7.2 Tubes shall be furnished in the following shapes, as specified by the purchaser: round, square, rectangular, or special shapes (as negotiated).

7.3 Recoating of the outside diameter weld-heat-affected area on precoated steel tubing may be performed at the manufacture's option, if not specifically requested by the purchaser.

8. Surface Finish

8.1 Special surface finishes as may be required for specific applications shall be provided in the purchase order by agreement between the producer and purchaser.

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TABLE 3 Wall Thickness Tolerance for Premetallic Coated As-Welded Tubing[A]
Outside Diameter, in.

Wall Thickness		½ to 1, incl		Over 1 to 1 15/16, incl		Over 1 15/16 to 3¾, incl		Over 3¾ to 4½, incl		Over 4½ to 6, incl		Over 6 to 8, incl	
		Wall Thickness Tolerance, in., Plus and Minus											
BWG[B]	in.[C]	Plus	Minus	Plus	Minus	Plus	Minus	Plus	Minus	Plus	Minus	Plus	Minus
22	0.028	0.002	0.006	0.002	0.006								
20	0.035	0.003	0.006	0.002	0.006	0.002	0.006						
18	0.049	0.004	0.007	0.003	0.008	0.003	0.008						
16	0.065	0.005	0.007	0.004	0.008	0.003	0.009	0.003	0.009	0.002	0.010		
14	0.083	0.006	0.008	0.006	0.008	0.005	0.009	0.005	0.009	0.004	0.010	0.004	0.010
13	0.095	0.008	0.010	0.008	0.010	0.007	0.011	0.007	0.011	0.006	0.012	0.006	0.012
12	0.109	0.008	0.010	0.008	0.010	0.007	0.011	0.007	0.011	0.006	0.012	0.006	0.012
11	0.120	0.009	0.011	0.009	0.011	0.008	0.012	0.008	0.012	0.007	0.013	0.007	0.013
10	0.134	0.009	0.011	0.009	0.011	0.008	0.012	0.008	0.012	0.007	0.013	0.007	0.013

[A] Post-hot dipped galvanized welded tubing wall thickness tolerances shall be determined by agreement between the producer and purchaser (6.2).
[B] Birmingham Wire Gage.
[C] 1 in. = 25.4 mm.

TABLE 4 Diameter Tolerances for Metallic-Coated Round Tubing

Outside Diameter Range, in.[A]	Wall Thickness		Tubing with Any Inside Flash Condition	Flash-Controlled to 0.005 in. Tubing Only[B]
	BWG[C]	in.[A]	Outside[D,E] Diameter, Plus and Minus	Inside Diameter, Plus and Minus
			Tolerances, in.[F]	
½ to 1⅛, incl	22 to 16	0.028/0.065	0.0035	0.019
Over 1⅛ to 2, incl	22 to 14	0.028/0.083	0.005	0.021
Over 1⅛ to 2, incl	13 to 10	0.095/0.134	0.005	0.027
Over 2 to 2½, incl	20 to 14	0.035/0.083	0.006	0.023
Over 2 to 2½, incl	13 to 10	0.095/0.134	0.006	0.029
Over 2½ to 3, incl	20 to 14	0.035/0.083	0.008	0.025
Over 2½ to 3, incl	13 to 10	0.095/0.134	0.008	0.031
Over 3 to 3½, incl	20 to 14	0.035/0.083	0.009	0.026
Over 3 to 3½, incl	13 to 10	0.095/0.134	0.009	0.032
Over 3½ to 4, incl	20 to 14	0.035/0.083	0.010	0.027
Over 3½ to 4, incl	13 to 10	0.095/0.134	0.010	0.033
Over 4 to 5, incl	16 to 14	0.065/0.083	0.020	0.037
Over 4 to 5, incl	13 to 10	0.095/0.134	0.020	0.043
Over 5 to 6, incl	16 to 14	0.065/0.083	0.020	0.037
Over 5 to 6, incl	13 to 10	0.095/0.134	0.020	0.043
Over 6 to 8, incl	14 to 10	0.083/0.134	0.025	0.048

[A] 1 in. = 25.4 mm.
[B] Flash controlled to 0.005 in. maximum tubing is produced to outside diameter tolerances and wall thickness tolerances, inside diameter tolerances and wall thickness tolerances, or outside diameter tolerances and inside diameter tolerances, in which the height of the remaining inside welding flash is controlled not to exceed 0.005 in. Any remaining flash is considered to be part of the applicable inside diameter tolerances.
[C] Birmingham Wire Gage.
[D] Flash-in tubing is produced to outside diameter tolerances and wall thickness tolerances only, and the height of the inside welding flash does not exceed the wall thickness or 3/32 in., whichever is less.
[E] Flash controlled to 0.010 in maximum tubing consists of tubing over ⅝ in. outside diameter which is commonly produced to outside diameter tolerances and wall thickness tolerances only, in which the height of the remaining inside welding flash is controlled not to exceed 0.010 in.
[F] The ovality shall be within the above tolerances except when the wall thickness is less than 3 % of the outside diameter, in which cases see 12.5.

9. Base Metal Chemical Composition

9.1 The chemical composition of the sheet steel base metal shall conform to the requirements of Table 1.

9.2 Copper-bearing steel, with 0.20 % minimum copper, may be ordered in any of the grades shown in Table 1 or Table 2.

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9.3 An analysis of each heat of steel shall be made by the basic steel producer to determine the percentage of the elements specified. The heat analysis, as supplied by the steel melter, shall conform to the requirements of Table 1 or Table 2.

9.4 When a grade is ordered under this specification, supplying an alloy grade that specifically requires the addition of any element other than those listed for the ordered grade in Table 1 and Table 2 is not permitted.

10. Coating Bath Chemical Composition

10.1 When tubing is produced from precoated sheet steel, the tubing manufacturer shall furnish, upon request, a report stating that the tubing has been manufactured from precoated sheet steel meeting one of the following specifications: A 463/A 463M, A 653/A 653M, A 792/A 792M, and A 924/A 924M.

10.2 For post-coated tubing the zinc used for coating shall be any grade of zinc conforming to Specification B 6.

11. Product Analysis

11.1 When requested on the purchase order, a product analysis shall be made by the supplier. The number and source of samples for a product analysis shall be based on the individual heat or lot identity of one of the following forms:

11.1.1 *Heat Identity Maintained*—One product analysis per heat shall be made on either the flat-rolled stock or tube.

11.1.2 *Heat Identity Not Maintained*—One product analysis shall be made from each 2000 ft (610 m) or fraction thereof for sizes over 3 in. (76.2 mm) outside diameter, and from each 5000 ft (1524 m) or fraction thereof for sizes 3 in. (76.2 mm) outside diameter and under.

11.2 Samples for product spectrochemical analysis shall be taken in accordance with procedures established with the tube producer and the testing laboratory. The composition thus determined shall correspond to the requirements in Table 1 or Table 2 and be within the composition tolerances shown in Table 5.

11.3 If the original test for product analysis fails, retests of two additional samples of flat-rolled stock or tubes shall be made. Both retests for the elements in question shall meet the requirements of Table 1 or Table 2, and Table 5, of this specification; otherwise, all remaining material in the heat or lot shall be rejected or, at the option of the producer, each length of flat-rolled stock or tube may be individually tested for acceptance. Any retested material not meeting the requirements of this specification shall be rejected.

TABLE 5 Tolerances for Product Analysis for Steels Shown in Table 1[A]

Element	Limit or Maximum of Specified Range, %	Variation, Over the Maximum Limit or Under the Minimum Limit	
		Under min, %	Over max, %
Carbon	to 0.15, incl	0.02	0.03
	over 0.15 to 0.40, incl	0.03	0.04
	over 0.40 to 0.55, incl	0.03	0.05
Manganese	to 0.60, incl	0.03	0.03
	over 0.60 to 1.00 incl	0.04	0.04
Phosphorus	. . .	. . .	0.01
Sulfur	. . .	. . .	0.01
Copper	. . .	0.02	. . .

[A] Individual determinations may vary from the specified heat limits or ranges to the extent shown in this table, except that any element in a heat may not vary both above and below a specified range.

12. Permissible Variations in Dimensions for Round Tubing

12.1 *Wall Thickness and Diameter*—Wall thickness tolerances for tubing made from precoated steel are shown in Table 3. All wall thickness tolerances include both the base steel and the coating (inside and outside surfaces). Variations in outside diameter and inside diameter of as-welded tubing made from precoated steel are shown in Table 4.

12.2 *Length*—Mechanical tubing is commonly furnished in mill lengths 5 ft (1.5 m) and over. Mill length tolerances are given in Table 6. Definite cut lengths are furnished when specified by the purchaser. Tolerances for definite length round tubing shall be given in Table 7 and Table 8. Different types of cutting methods will affect the end cut.

12.3 *Squareness of Cut*—When specified, the tolerance for squareness of cut of round mechanical tubing is shown in Table 9. Measurements are made with the use of an "L" square and feeler gage. The contact length of the side leg of the square along the tube will be equal to or greater than the tube outside diameter, but not less than 1 in. (25.4 mm) nor greater than 4 in. (101.6 mm). The other leg shall always be equal to or greater than the tube outside diameter.

12.4 *Straightness*:

12.4.1 *Post-Coated Tubing*—The straightness tolerance for round mechanical tubing shall be 0.030 in. (0.762 mm) maximum in any 3-ft (0.914-m) length of tubing. The straightness tolerance on shorter lengths and on special requirements shall be agreed upon between the purchaser and producer.

12.4.2 *Precoated Tubing*—The straightness requirement for post-coated tubing shall be by agreement between the purchaser and producer.

12.5 *Ovality*—The ovality shall be within the tolerances of Table 4 except when the wall thickness is less than 3 % of the outside diameter. When the tube wall thickness is less than 3 % of the tube outside diameter the ovality may be 50 % greater than the outside diameter tolerances, but the mean diameter (average of maximum outside diameter and minimum outside diameter) shall be within the specified tolerance.

13. Permissible Variations in Dimensions of Square and Rectangular Tubing

13.1 *Diameter and Wall Thickness*—Permissible variations in outside dimensions for square and rectangular tubing are shown in Table 10. The wall thickness tolerance is ±10 % of the nominal wall thickness and is measured at the center width of the unwelded sides.

TABLE 6 Mill Cut-Length Tolerances for Round, Square, and Rectangular Tubing

Outside Diameter Size, in.[A]	5 ft to Under 24 ft	24 ft and Over[B]
½ to 8, incl	+1.0, −0.0 in.	+4.0, −0.0 in.

[A] 1 in. = 25.4 mm.

[B] Manufacturing practices may limit the length available; therefore, when inquiring, it is essential to describe the product fully.

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TABLE 7 Cut Length Tolerances for Lathe-Cut Round Tubing

Outside Diameter Size, in.[A]	6 in. and Under 12 in.	12 in. and Under 48 in.	48 in. and Under 10 ft	10 ft to 24 ft, incl[B]
⅜ to 3, incl	±1/64	±1/32	±3/64	±⅛
Over 3 to 6, incl	±1/32	±3/64	±1/16	±⅛
Over 6 to 8, incl	±1/16	±1/16	±⅛	±⅛

[A] 1 in. = 25.4 mm.
[B] For each additional 10 ft or fraction thereof over 24 ft, an additional allowance should be made of ±1/16 in.

TABLE 8 Cut-Length Tolerances for Tubing Punch-, Saw-, or Disc-Cut Round Tubing

Outside Diameter Size, in.[A]	6 in. and under 12 in.	12 in. and under 48 in.	48 in. and under 10 ft.	10 ft. and 24 ft. incl
⅛ to 3 incl.	±1/16 in.	±1/16 in.	±⅛ in.	±¼ in.
Over 3 to 6, incl.	±1/16 in.	±1/16 in.	±⅛ in.	±¼ in.
Over 6 to 8, incl.	±1/16 in.	±1/16 in.	±⅛ in.	±¼ in.

[A] 1 in. = 25.4 mm

TABLE 9 Tolerance for Squareness of Cut (Either End) When Specified for Round Tubing[A,B]

Length of Tube, ft[C]	Outside Diameter, in.[B,D]				
	Under 1	1 to 2, incl	Over 2 to 3, incl	Over 3 to 4, incl	Over 4
Under 1	0.006	0.008	0.010	0.015	0.020
1 to 3, incl	0.008	0.010	0.015	0.020	0.030
Over 3 to 6, incl	0.010	0.015	0.020	0.025	0.040
Over 6 to 8, incl	0.015	0.020	0.025	0.030	0.040

[A] Actual squareness normal to length of tube, not parallelness of both ends.
[B] Values given are "go" value of feeler gage. "No-go" value is 0.001 in. greater in each case.
[C] 1 ft = 0.3 m.
[D] 1 in. = 25.4 mm.

13.2 *Corner Radii*—Unless otherwise specified the inside and outside corners of square and rectangular tubing shall be slightly rounded, consistent with the tube wall thickness. A slight radius flattening can be expected and is more pronounced with heavier-walled tubing. However, the radii of the corners shall be in accordance with Table 11.

13.3 *Squareness of Sides*—Permissible variation of squareness of sides shall be determined by the following equation:

$$\pm b = c \times 0.006 \text{ in.}$$

where:
b = tolerance for out-of-square, and
c = largest external dimension across flats.

The squareness of sides is commonly determined by one of the following methods:

13.3.1 A square with two adjustable contact points on each arm is placed on two sides. A fixed feeler gage is then used to measure the maximum distance between the free contact point and the surface of the tubing.

13.3.2 A square equipped with a direct-reading vernier may be used to determine the angular deviation that, in turn, may be related to distance in inches.

13.4 *Length*—Tolerances for mill cut-length square and rectangular tubing shall not exceed the amounts shown in Table 4. Tolerances for definite length square and rectangular tubing shall not exceed the amount shown in Table 12.

TABLE 10 Tolerances, Outside Dimensions[A] Square and Rectangular Tubing

Largest Nominal Outside Dimension, in.[B]	Wall Thickness, in.[B]	Outside Tolerance at All Sides at Corners, ± in.[B]
3/16 to ⅝, incl	0.020 to 0.083, incl	0.004
Over ⅝ to 1⅛, incl	0.025 to 0.134, incl	0.005
Over 1⅛ to 1½, incl	0.025 to 0.134, incl	0.006
Over 1½ to 2, incl	0.032 to 0.134, incl	0.008
Over 2 to 3, incl	0.035 to 0.134, incl	0.010
Over 3 to 4, incl	0.049 to 0.134, incl	0.020
Over 4 to 6, incl	0.065 to 0.134, incl	0.020
Over 6 to 8, incl	0.085 to 0.134, incl	0.025

Convexity and concavity: Tubes having two parallel sides are also measured in the center of the flat sides for convexity and concavity. This tolerance applies to the specific size determined at the corners, and is measured on the following basis:

Largest Nominal Outside Dimension, in.	Tolerance, Plus and Minus, in.
2½ and under	0.010
Over 2½ to 4	0.015
Over 4 to 8	0.025

[A] Measured at corners at least 2 in. from the cut end of the tubing.
[B] 1 in. = 25.4 mm.

TABLE 11 Radii of Corners of Electric-Resistance Welded Square and Rectangular Tubing[A]

Squares and Rectangles Made from Tubes of the Following Diameter Ranges, in.[B]	Wall Thickness, BWG (in.)[B]	Radius Ranges, in.[C]
½ to 1½, incl	22 (0.028)	1/32 to 1/16
½ to 2½, incl	20 (0.035)	1/32 to 1/16
½ to 4, incl	18 (0.049)	3/64 to 5/64
½ to 4⅛, incl	16 (0.065)	1/16 to 7/64
¾ to 4⅛, incl	14 (0.083)	5/64 to ⅛
Over 4⅛ to 6, incl	14 (0.083)	3/16 to 5/16
1 to 4⅛, incl	13 (0.095)	3/32 to 5/32
Over 4⅛ to 6, incl	13 (0.095)	3/16 to 5/16
1¼ to 4, incl	12 (0.109)	⅛ to 13/64
Over 4 to 6, incl	12 (0.109)	3/16 to 5/16
1¼ to 4, incl	11 (0.120)	⅛ to 7/32
Over 4 to 6, incl	11 (0.120)	7/32 to 7/16
2 to 4, incl	10 (0.134)	5/32 to 9/32
Over 4 to 6, incl	10 (0.134)	7/32 to 7/16
Over 6 to 8, incl	10 (0.134)	⅜ to ⅝

[A] This table establishes a standard radius. The purchaser and producer may negotiate special radii. Slight radius flattening is more pronounced in heavier wall tubing.
[B] 1 in. = 25 mm.
[C] These radius tolerances apply to grades of steel covered in Table 1. The purchaser and producer may negotiate tolerances on other grades of steel.

TABLE 12 Length Tolerances for Definite Length Square and Rectangular Tubing

Lengths, ft[A]	Tolerances, in.[B]
1 to 3, incl	±1/16
Over 3 to 12, incl	±3/32
Over 12 to 20, incl	±⅛
Over 20 to 30, incl	±3/16
Over 30 to 40, incl	±¼

[A] 1 ft = 0.3 m.
[B] 1 in. = 25.4 mm.

13.5 *Twist*—Twist tolerances are shown in Table 13. The twist in square and rectangular tubing may be measured by holding one end of the tubing on a surface plate and noting the height of either corner of the opposite end of the same side

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TABLE 13 Twist Tolerances Electric-Resistance-Welded for Square and Rectangular Mechanical Tubing

Largest Dimension, in.[A]	Twist Tolerance in 3 ft,[B] in.[A]
Under ½	0.032
Over ½ to 1½ , incl	0.050
Over 1½ to 2½ , incl	0.062
Over 2½ to 4, incl	0.075
Over 4 to 6, incl	0.087
Over 6 to 8, incl	0.100

[A] 1 in. = 25.4 mm.
[B] 1 ft = 0.3 m.

above the surface plate. Twist may also be measured by the use of a beveled protractor equipped with a level, and noting the angular deviation on opposite ends, or at any point throughout the length.

13.6 *Straightness*—The straightness tolerance is 1⁄16 in. in 3-ft length (1.7 mm/m).

13.7 *Squareness of Cut*—If required, the squareness of cut for square and rectangular tubing shall be equal to or less than 0.050 in. (1.27 mm). Measurements are made with an "L" square and feeler gage. The contact length of the side leg of the square along the tube will be equal to or greater than the largest outside dimension of the tube but shall never be less than 1 in. (25.4 mm) nor greater than 4 in. (101.6 mm). The other leg will always be equal to or greater than the largest outside dimension of the tube.

14. Tubing Sections Other Than Square and Rectangular

14.1 In addition to square and rectangular tubing, many producers supply a wide variety of special sections. However, manufacturing practices limit the size range and sections that are available from the various producers. Since the sections are special, they must be inquired on an individual basis giving full details as to dimensions and finish.

15. Workmanship, Finish, and Appearance

15.1 The tubing shall have a workmanlike finish.

15.2 When burrs must be removed from one or both ends, it shall be specified in the purchase order.

16. Oiling

16.1 When specified, tubing shall have a protective coating applied before shipping to retard white rust of the metallic coating on closely nested products and red rust on non-recoated outside diameter weld areas. Should the order specify shipment without a protective coating, the lubricant incidental to manufacturing will remain and the purchaser will assume responsibility for rust in transit and storage.

17. Rejection

17.1 Tubes that fail to meet the requirements of this specification shall be set aside and the producer shall be notified.

18. Product Marking

18.1 Each box, bundle, lift, or piece shall be identified by a tag or stencil with the manufacture's name or brand, specified size, type, purchaser's order number, and this specification number.

18.2 *Bar Coding*—In addition to the requirements in 18.1 bar coding is acceptable as a supplemental identification method. The purchaser may specify in the order a specific bar coding system to be used.

19. Packaging

19.1 On tubing 16 gage (1.65 mm nominal) and lighter, the producer will determine whether or not the tubing will be boxed, crated, cartoned, packaged in secured lifts, or bundled to ensure safe delivery unless otherwise instructed. Tubing heavier than 16 gage will normally be shipped loose, bundled, or in secured lifts. Special packaging requiring extra operations other than those normally used by a producer must be specified on the order.

20. Keywords

20.1 carbon steel tube; metallic-coated tubing; resistance welded steel tube; steel tube; welded steel tube

SUMMARY OF CHANGES

Committee A01 has identified the location of selected changes to this specification since the last issue, A 787 – 01, that may impact the use of this specification. (Approved March 1, 2005)

(*1*) Revised Table 4.

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